Original Research Article

Physical Activity, Sedentary Behaviour and Physical Fitness among Male Adolescents with and without Intellectual Disability in Kinshasa, Democratic Republic of Congo

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ABSTRACT

Background: Physical activity, sedentary behaviour, and physical fitness are key health indicators, yet they remain under-documented in the Democratic Republic of Congo, particularly among adolescents with intellectual disability (ID).

Objective This study aimed to (i) compare levels of physical activity, sedentary behavior, body composition, and physical fitness between adolescents with and without intellectual disability, and (ii) examine the associations between body composition and physical fitness variables.

Method: A cross-sectional analytical study was conducted over a three-month period (November 2022 to February 2023) among 322 male adolescents aged 12-17 years attending school in Kinshasa, Democratic Republic of Congo. A stratified convenience sampling strategy was used, whereby schools were first stratified by type (specialized vs. mainstream), and participants were then recruited based on availability within each stratum. The sample included 180 adolescents with clinically diagnosed moderate intellectual disability and 142 without ID. Physical fitness (balance, flexibility, and upper limb strength) was assessed using standardized EUROFIT tests. Body composition (waist circumference, fat mass, and muscle mass) was measured using anthropometry and bioelectrical impedance. Physical activity and sedentary behavior were assessed using the validated CAPAS-Q questionnaire. Group comparisons were conducted using Student's t-test or Mann–Whitney U test, and χ^2 tests for categorical variables. Effect sizes (Cohen's d, Cramér's V) and regression analyses were computed.

Results: Adolescents with ID showed higher waist circumference (66.2±1.5 vs 65.6±1.3, d = -0.42, $p < 0.001$) and body fat percentage (21.0±1.9 vs 20.6±1.6, d = -0.26, p = 0.017), and lower muscle mass (20.9±2.6 vs 25.5±2.9, d = 0.69, $p < 0.001$) compared to peers without ID. They also demonstrated lower flexibility (8.3±2.1 vs 12.8±1.8, d = 2.26, $p < 0.001$) and balance (6.8±3.4 vs 10.0±2.2, d = 1.09, $p < 0.001$). Sedentary behavior was significantly higher (Cramér's V = 0.73–0.88, $p < 0.001$), while physical activity levels were lower (Cramér's V = 0.50–0.84, $p < 0.001$). Regression analyses indicated that muscle mass positively predicted flexibility (β = 0.57, p < 0.001) and balance (β = 0.81, p < 0.001), whereas waist circumference negatively predicted both outcomes.

Conclusion: Adolescents with intellectual disability exhibit lower physical activity, higher sedentary behavior, poorer body composition, and reduced physical fitness compared to their peers. Body composition, particularly muscle mass and abdominal adiposity, is strongly associated with physical fitness outcomes. These findings highlight the need for targeted, inclusive physical activity interventions in the Congolese context.

Keywords: Physical activity; Adolescents; Intellectual disability; Physical fitness; Sedentary behaviour.

INTRODUCTION

Adolescents with intellectual disability (ID) represent a particularly vulnerable group in terms of physical health. Research consistently shows that these youths exhibit significantly lower levels of physical activity and higher levels of sedentary behaviour compared with their peers without ID (Elmahgoub, 2025; McGarty et al., 2021; Choi et al., 2020; Xu et al., 2020; Holloway et al., 2018). These generally unfavourable lifestyle patterns are often associated with reduced overall physical fitness, particularly with respect to balance, flexibility, and muscular strength, especially in the upper limbs (Lee et al., 2016; Pace & Bricout, 2015; Jaakkola et al., 2021; Herwegen et al., 2018; Sansi et al., 2019).

In the Democratic Republic of the Congo (DRC), approximately 13 million people live with a disability, representing nearly 18% of the population, including individuals with ID (Langwana & Bitumba, 2016). This high prevalence may be explained by several factors, including armed conflicts, domestic accidents, disabling diseases, and limited access to preventive and curative healthcare services (Omadjela & Angalawe, 2022; World Health Organization, 2022).

Adolescents with ID in the DRC face multiple forms of marginalization. They are often stigmatized and sometimes kept at home due to sociocultural beliefs associating disability with family shame (Aldersey et al., 2014; Kuper et al., 2020). Even when enrolled in special schools, these adolescents have very limited access to adapted physical activity (APA) programs. This situation may be explained by a lack of sports infrastructure, insufficient teacher training in APA, and limited support from families and the educational community. As a result, these adolescents are at increased risk of low physical activity levels, deteriorating physical fitness, and higher sedentary behaviour. Furthermore, in the sociocultural context of the DRC where masculinity is often associated with physical performance and strength, poor physical fitness among boys with ID may exacerbate stigma and further limit their social participation and autonomy.

Despite these challenges, no empirical study has yet been conducted in the DRC to systematically examine physical activity levels, sedentary behaviour, and physical fitness among male adolescents with ID. This lack of contextual data represents a major barrier to the development of appropriate, inclusive, and culturally relevant interventions (Mactaggart et al., 2018; Bright et al., 2019).

The present study is guided by the following research question: What are the levels of physical activity, the extent of sedentary behaviour, and the state of physical fitness among adolescents with intellectual disability in the Congolese context, and how do these variables interact with one another?

The objectives of this study are: (1) to assess physical activity levels, sedentary behaviour, and physical fitness among adolescents with ID enrolled in schools in Kinshasa, and to compare them with their peers without ID; (2) to analyse the relationships between physical activity, sedentary behaviour, and physical fitness; and (3) to examine the association between these variables and body composition indicators.

We hypothesize that adolescents with ID have lower levels of physical activity, higher levels of sedentary behaviour, and poorer physical fitness compared with their peers without ID. It is also assumed that physical activity is positively associated with physical fitness, whereas sedentary behaviour is negatively associated with it. Finally, body composition indicators, particularly body mass index and fat mass, are expected to be significantly associated with physical fitness and to influence the relationships between physical activity, sedentary behaviour, and physical performance (Carbone et al., 2020; Hills et al., 2021).

METHODS

Study Design and Setting

This study was a cross-sectional analytical observational study conducted in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines (Von et al., 2007). The study was carried out in Kinshasa, Democratic Republic of Congo, across seven secondary-level schools, including five specialized institutions for adolescents with intellectual disabilities (Bondeko Twendeleye Village, Sembola, Mawete, Kikesa Centre, and Bon Départ School) and two mainstream schools (Complexe Scolaire Les Chérubins and École Frère Emmanuel Stablum). These institutions were purposively selected based on their accessibility, their enrollment of adolescents with and without intellectual disabilities, and their capacity to support standardized physical fitness assessments.

Study Population

The target population consisted of male adolescents aged 12 to 17 years who were enrolled in either specialized or mainstream schools in Kinshasa. The study population included all eligible adolescents attending the selected schools during the study period. Participants were categorized into two groups: adolescents with intellectual disability (ID group) and adolescents without intellectual disability (control group).

Identification and Classification of Intellectual Disability

Adolescents with intellectual disability were identified through a two-step verification process:

1. **Clinical diagnosis:** Participants in the ID group had a prior diagnosis of moderate intellectual disability established by qualified neuropsychiatrists or clinical psychologists, based on standardized diagnostic criteria consistent with international classifications (DSM or ICD frameworks as applied in the institutions).
2. **Institutional verification:** The diagnosis was confirmed through review of school medical and administrative records. These records included clinical assessments and educational placement documentation indicating enrollment in specialized education programs for intellectual disability.

No additional diagnostic screening was conducted by the research team; only previously established and documented diagnoses were used to ensure reliability and ethical compliance.

Adolescents in the control group were recruited from mainstream schools and had no history or record of intellectual disability, as confirmed by school records and teacher reports.

Sampling Procedure

A multi-stage stratified convenience sampling strategy was employed.

Stage 1: Stratification of schools

Schools were first stratified into two categories:

- Specialized schools (for adolescents with intellectual disabilities)
- Mainstream schools (for adolescents without intellectual disabilities)

Stage 2: Selection of schools

Within each stratum, schools were selected purposively based on accessibility, willingness to participate, and suitability for conducting physical assessments.

Stage 3: Participant recruitment

Within each selected school, eligible participants were recruited using a convenience sampling approach. All adolescents meeting the inclusion criteria and present during the data collection period were invited to participate. This approach allowed the inclusion of participants from different institutional contexts while accounting for logistical and ethical constraints.

Sample Size and Distribution

The final sample consisted of 322 male adolescents, including 180 adolescents with intellectual disability and 142 adolescents without intellectual disability. Participants were recruited from seven schools, namely Bondeko Twendeleye Village (n = 48), Sembola (n = 40), Mawete (n = 30), Kikesa Centre (n = 32), Bon Départ School (n = 30), Complexe Scolaire Les Chérubins (n = 80), and École Frère Emmanuel Stablum (n = 62).

Inclusion Criteria

Participants in the intellectual disability (ID) group were male adolescents aged 12–17 years who were enrolled in specialized schools. All participants in this group had a confirmed diagnosis of moderate intellectual disability made by a qualified professional, with diagnoses verified through school records. In addition, all adolescents were medically cleared for participation in physical activity and provided assent, alongside informed consent from their parents or legal guardians.

The control group consisted of male adolescents aged 12–17 years enrolled in mainstream schools. Participants in this group had no diagnosis of intellectual disability, were medically cleared for physical activity, and similarly provided assent with parental or guardian consent prior to participation.

Data Collection

A structured data collection form was developed to record sociodemographic information (age), body composition variables (waist circumference, body fat percentage, and muscle mass percentage), and physical fitness components (balance, flexibility, and upper limb strength). This form was supplemented by the *Children and Adolescents Physical Activity and Sedentary Questionnaire (CAPAS-Q, 8–18 years)* to assess physical activity levels and sedentary behaviours in the school context.

Questionnaire

The Children and Adolescents Physical Activity and Sedentary Questionnaire (CAPAS-Q; 8-18 years) was used to assess physical activity levels and sedentary behaviours across different contexts. For this study, only school-related dimensions were considered. Although this instrument has been previously used in adolescent populations, its validation should be explicitly supported by appropriate references, and key information regarding its development and psychometric properties needs to be clearly documented. Moreover, it should be noted that the CAPAS-Q has not yet been formally validated in the Congolese context.

Rather than detailing individual items, the questionnaire was operationalized by grouping variables into two domains: physical activity (e.g., indicators related to intensity and daily movement within the school setting) and sedentary behaviour (e.g., time spent sitting and screen-related activities during school hours). Internal consistency of the selected items was assessed using Cronbach's alpha, with reference to prior methodological work (e.g., Fillon et al., 2022), although further clarification of this analytical approach is warranted.

The questionnaire was administered under standardized conditions and supervised by the principal investigator. To ensure comprehension among adolescents with intellectual disabilities, questions were read aloud and, when necessary, simplified or reformulated while attempting to limit interviewer-induced bias. Additional details regarding the mode of administration, scoring procedures, and measurement protocols should be provided to strengthen methodological transparency and reproducibility.

Physical Fitness Tests

Based on previous studies involving individuals with intellectual disabilities, three tests from the EUROFIT battery were used: balance, flexibility, and flexed-arm hang tests. These were complemented by body composition measurements (waist circumference, body fat percentage, and muscle mass percentage).

Body Composition Measurements

Body composition measurements were conducted in accordance with the standards of the International Society for the Advancement of Kinanthropometry (ISAK, 2019). For adolescents with intellectual disabilities, adaptations such as simplified instructions and assistance were provided.

Waist Circumference

Waist circumference was measured using a SECA 201 tape measure (SECA GmbH, Hamburg, Germany; precision ±1 mm). Participants stood upright with feet shoulder-width apart and arms relaxed at their sides. The tape was placed horizontally at the upper border of the iliac crest, parallel to the ground. Measurements were taken after normal expiration without abdominal contraction. Two measurements were recorded and the mean value was used.

Body Mass Index (BMI)

BMI was calculated using the formula: weight (kg) / height (m^2). Weight was measured using a Seca 760 scale (Hamburg, Germany; precision 0.1 kg), and height was measured with a Seca stadiometer (range 0–200 cm; precision 0.1 cm).

Body Fat and Muscle Mass

Body composition (fat mass and muscle mass) was assessed using a bioelectrical impedance analyser (OMRON BF511, Omron Healthcare, Kyoto, Japan; accuracy ±1% for fat mass and ±0.1 kg for muscle mass). Participants stood barefoot on the device electrodes, holding the handles with their arms relaxed at their sides. Metallic or electronic objects were removed before measurement. Assessments were performed after at least two hours post-exercise or fasting conditions to standardize hydration status. Two measurements were taken and averaged.

Physical Fitness Tests

Participants wore standardized sports clothing. Evaluators were trained, and familiarization sessions were conducted. Close supervision was ensured in accordance with recommendations for functional assessment in this population (Léger et al., 1988). All tests followed EUROFIT protocols, with prior demonstrations to ensure understanding and safety. Teachers from each class assisted in the process.

Flamingo Balance Test

Static balance was assessed using the Flamingo Balance Test. Participants maintained one-leg stance on a narrow beam for 60 seconds. Each participant had three attempts, and the best score was recorded.

Sit-and-Reach Test

Flexibility was assessed using the Sit-and-Reach test. Participants were asked to bend forward from a seated position with legs extended. Two trials were performed, and the best score (cm) was recorded.

Flexed-Arm Hang Test

Upper limb strength was assessed using the flexed-arm hang test, in which participants hung from a bar with the chin above the bar for as long as possible. The score corresponded to the duration (seconds).

Data Analysis

Data were entered using Microsoft Excel 2013, checked for quality control, and analysed using Jamovi software version 2.6.44. Minimum sample size was estimated using G*Power version 3.1, indicating at least 53 participants per group to detect statistically significant differences. Quantitative variables were expressed as means ± standard deviations, while categorical variables were presented as frequencies and percentages. Normality was assessed using the Shapiro-Wilk test and Q–Q plots.Group comparisons were performed using the independent Student's t-test for normally distributed data and the Mann–Whitney U test for non-normal distributions. The Chi-square test was used for categorical variables, and Fisher's exact test was applied when expected frequencies were below 5. Multiple linear regression analyses were conducted to examine associations between body composition (independent variables) and physical fitness outcomes (dependent variables). Each fitness outcome was analysed in a separate model, adjusting for age where appropriate. Standardized β coefficients, p-values, and 95% confidence intervals were reported. Model assumptions were verified (linearity, independence of residuals, normality, homoscedasticity, and multicollinearity with VIF < 5). Only models meeting these assumptions were retained. Pearson correlation coefficients were used for normally distributed variables, and Spearman's rank correlation for non-normal distributions. Effect sizes were calculated using Cohen's d (small = 0.2, moderate = 0.5, large ≥ 0.8) and Cramer's V for categorical variables. Statistical significance was set at $p < 0.05$ (two-tailed). Overall, the methodological and ethical choices of this study were guided by the aim of producing rigorous, respectful, and useful findings for professionals, families, and stakeholders involved in the inclusion of adolescents with intellectual disabilities.

Ethical Considerations

The study protocol was reviewed and approved by the National Ethics Committee of the Ministry of Public Health of the Democratic Republic of the Congo (Approval No. 404/CNES/BN/PMMF/2022, dated 30 October 2022). The study was conducted in accordance with international ethical principles governing research involving human participants. Written informed consent was obtained from parents or legal guardians, and assent was obtained from all participating adolescents. Data were anonymized prior to statistical analysis. Participants had the right to withdraw from the study at any time without any consequences.

RESULTS

Table 1 indicates that adolescents with intellectual disability (ID) had significantly higher waist circumference and body fat percentage compared to their peers without ID ($d = -0.42$ to -0.26, $p \leq 0.017$). In contrast, muscle mass percentage was significantly lower in the ID group ($d = 0.69$, $p < 0.001$). Regarding physical fitness, adolescents with ID demonstrated markedly poorer performance in flexibility ($d = 2.26$, $p < 0.001$) and balance ($d = 1.90$, $p < 0.001$). However, no significant difference was observed in upper limb strength between the two groups ($d = 0.03$, $p = 0.777$). Age did not differ significantly between groups ($d = 0.21$, $p = 0.062$), indicating comparability in this characteristic.

Table 1. Comparison of mean sociodemographic, body composition, and physical fitness of adolescents with and without intellectual disabilities.

	Boys with DI (n=180)	Boys without DI (n=142)		
Variables	Mean±SD	Mean±SD	P	Size effect Cohen's [CI 95%]
Age (year)	13.2±0.8	13.0±0.7	0.062	0.21 [0.04, 0.49]
BMI (kg/m2)	21.6±2.4	21.1±2.5	0.131	0.21[-0.44,0.02]
Waist circumference (cm)	66.2±1.5	65.6±1.3	<.001	-0.42 [-0.63,-0.19]
Total fat (%)	21.0±1.9	20.6±1.6	0.017	-0.26 [-0.48,-0.05]
Muscle (%)	20.9±2.6	25.5±2.9	<.001	0.69 [0.46, 0.92]
Flexibility(cm)	8.3±2.1	12.8±1.8	<.001	2.26 [1.98, 2.54]
Balance (seconds)	6.8±3.4	10.0±2.2	<.001	1.09 [0.85, 1.33]
Arm strength (seconds)	2.6±1.0	2.7±1.1	0.777	0.03 [-0.18, 0.25]

ID : Intellectual disability, BMI : body mass index, SD : standard deviation, CI : confidence interval

Table 2. Comparison of School-Based Physical Activity Levels between male Adolescents with and without Intellectual Disability

Variables/categories	Boys with ID (n=180) N(%)	Boys without ID (n=142) N(%)	p (Chi²)	Effect size (Cramér's V)
Number of PA hours at school (Q1)			<.001	0.70
Less than 2 hours	117 (65.0%)	-		
2 to 4 hours	47 (26.1%)	134 (94.4%)		
4 to 6 hours	16 (8.9%)	8 (5.6%)		
More than 6 hours	-	-		
Occurence of sweating during the PA (Q2)			<.001	0.84
No way	152 (84.4%)	5 (3.5%)		
A little	21 (11.7%)	60 (42.3%)		
Moderately	7 (3.8%)	40 (28.2%)		
A lot	-	37 (26.1%)		
Daily time spent walking or running (Q3)			<.001	0.57
Less than 15 minutes	154 (85.6%)	56 (39.4%)		
15 to 30 minutes	26 (14.4%)	63 (44.4%)		
30 minutes to 1 hour	-	16 (11.3%)		
More than 1 hour	-	7 (4.9%)		
Occurrence of Breathlessness walking (Q4)			<.001	0.50

No way	160 (88.8%)	42 (33.8%)		
A little	14 (7.7%)	52 (41.9%)		
Moderately	6 (3.3%)	19 (15.3%)		
A lot	-	11 (8.8%)		
Number of flights of stairs climbing per day (Q5)			<.001	0.73
Less than 2	48 (26.6%)	43 (30.3%)		
3 to 5	5 (2.7%)	41 (28.9%)		
6 to 10	-	22 (15.5%)		
More than 10	-	36 (25.4%)		

N=180 boys with ID, n=142 boys without ID. Cramer's V=0.1 : low , 0.3=medium, 0.5=high, PA: physical activity

Adolescents with intellectual disability (ID) demonstrated significantly lower levels of daily physical activity compared with their peers without ID ($p < 0.001$), with very strong effect sizes (Cramer's V = 0.50–0.84). The majority of adolescents with ID reported engaging in less than 2 hours of physical activity at school (65% vs. 0%), and the absence of sweating during physical activity was far more frequent in this group (84.4% vs. 3.5%). Similarly, most adolescents with ID reported walking or running for less than 15 minutes per day (85.6% vs. 39.4%) and rarely experienced breathlessness or sweating during activity (88.8% vs. 33.8%). In addition, adolescents with ID more frequently reported climbing fewer than two flights of stairs per day (26.6% vs. 30.3%) compared with their peers without ID, who generally exhibited higher overall activity levels (Table 2).

Table 3. Comparsion of School-Based Sedentarity Behaviour between male adolescents with and without Intellectual Disabilities

Variables/categories	Boys with ID (n=180) N(%)	Boys without ID (n=142) N(%)	p (Chi²)	Effect size (Cramér's V)
Time spent sitting/day in class			p<.001	0.73
Less than 2 hours	-	45 (31.7%)		
2 to 4 hours	6 (3.3%)	19 (13.4%)		
4 to 6 hours	22 (12.2%)	26 (18.3%)		
6 to 8 hours	145 (80.5%)	25 (17.6%)		
8 to 10 hours	7 (3.8%)	15 (10.6%)		
More than 10 hours	-	12 (8.5%)		
Time spent in front of the screen			p<.001	0.88
Less than 30 minutes	-	61 (43.0%)		
30 minutes to 1 hour	-	37 (26.1%)		
1 to 1.5 hours	6 (3.3%)	12 (8.5%)		
1.5 to 2 hours	139 (77.2%)	8 (5.6%)		
2 to 2.5 hours	30 (16.7%)	5 (3.5%)		
More than 2 hours and 30 minutes	5 (2.7%)	19 (13.4%)		

How many times have I spent sitting for more than 1 hour and 30 minutes without moving?			p<.001	0.76
0 times	-	25 (17.6%)		
1 time	-	26 (18.3%)		
Twice	8 (4.4%)	22 (15.5%)		
3 times	51(28.3)	19 (13.4%)		
4 times	90 (50.0%)	16 (11.3%)		
more than 4 times	31 (17.3%)	34 (23.9%)		

N=180 adolescents with ID, n=142 adolescents without ID. Cramer's V=0.1: low, 0.3=medium, 0.5=high

Table 3 shows that adolescents with intellectual disability (ID) exhibited significantly higher levels of sedentary behaviour compared with their peers without ID. In the classroom setting, a large proportion of adolescents with ID reported prolonged sitting time of 6–8 hours per day (80.5% vs. 17.6%, $p < 0.001$; Cramer's V = 0.73). Similarly, screen-based sedentary time was substantially higher in the ID group, with 77.2% reporting 1.5–2 hours of screen exposure compared to 5.6% in the non-ID group ($p < 0.001$; Cramer's V = 0.88). In addition, adolescents with ID more frequently reported prolonged uninterrupted sitting episodes (>1.5 hours), with 50% indicating being seated at least four times per day compared to 11.3% of their peers without ID ($p < 0.001$; Cramer's V = 0.76).

Table 4. Linear regression analysis between flexibility and body composition variables

					95% confidence interval		
Predictor	B	Standard error	t	P	Terminal inf	Superior	VIF
Originally ordered	31.3203	6.3206	4.955	<.001	18,885	43.7559	
Waist circumference	-0.4184	0.1033	-4.048	<.001	-0.622	-0.2150	1.24
Total Fat	-0.2977	0.0952	-3.128	0.002	-0.485	-0.1105	1.61
Muscle	0.5701	0.0448	12,721	<.001	0.482	0.6583	1.55

N=180

Table 4 presents the results of the linear regression analysis examining the association between body composition and flexibility. Flexibility was significantly associated with body composition variables. A positive relationship was observed between muscle mass percentage and flexibility ($\beta = 0.57$, $p < 0.001$), indicating that higher muscle mass is associated with better flexibility performance. In contrast, waist circumference ($\beta = -0.42$, $p < 0.001$) and total body fat percentage ($\beta = -0.30$, $p < 0.002$) were significant negative predictors of flexibility. Assessment of multicollinearity using variance inflation factors (VIF < 1.61) indicated no evidence of problematic collinearity among the independent variables (Table 4).

Table 5. Linear regression analysis between equilibrium and body composition variables

95% confidence interval

Predictor	B	Standard error	T	P	Terminal inf	Superior	VIF
Originally ordered	0.1100	4.2395	0.0260	0.979	-8.2311	8.4511	
Waist circumference	-0.1705	0.0693	-2.4591	0.014	-0.3068	-0.0341	1.24
Total Fat	0.0546	0.0638	0.8548	0.393	-0.0710	0.1801	1.61
Muscle	0.8088	0.0301	26.9046	<.001	0.7496	0.8679	1.55

N=180

This regression analysis table indicates that balance is significantly influenced by body composition. Muscle mass was identified as a major positive predictor ($\beta = 0.81$, $p < 0.001$), whereas waist circumference showed a moderate negative but non-significant effect ($\beta = 0.05$, $p = 0.393$). The variance inflation factors (VIF < 1.61) indicate the absence of problematic multicollinearity (Table 5).

Table 6. Correlation between age, body composition parameters and motor skills in adolescents with intellectual disabilities

Variables		Age	Waist circumference	Total Fat	Muscle	BMI	Flexibility	Balance	FBMG
Age	Pearson's r	—	r=0.141**	r=0.132**	r=0.316***	r=-0.024	0.275***	0.335***	0.001
	p-value	—	p=0.006	p=0.009	p<.001	p=0.678	<.001	<.001	p=0.490
Waist circumference	Pearson's r	0.141**	—	0.365***	0.363***	0.291***	-0.020	0.250***	0.112*
Total Fat	Pearson's r	0.132**	0.365***	—	0.568***	0.362***	0.139**	0.496***	0.197***
Muscle	Pearson's r	r=0.316***	0.363***	0.568***	—	0.300***	0.528***	0.875***	0.183***
Flexibility	Pearson's r	0.275***	-0.020	0.139**	0.528***	0.050	—		0.095*
Balance	Pearson's r	0.335***	0.250***	0.496***	0.875***	0.212***	0.665***	—	0.169
FBMG	Pearson's r	0.001	0.112*	0.197***	0.183***	0.088	0.095*	0.169**	—

N=180 boys. r=Pearson correlation. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, two-tailed test

Pearson correlation analyses (Table 6) revealed significant associations between age, body composition, and motor skills among adolescents (n = 180). Age was positively correlated with muscle mass ($r = 0.316$, $p < 0.001$), flexibility ($r = 0.275$, $p < 0.001$), and balance ($r = 0.335$, $p < 0.001$). However, no significant association was observed between age and upper limb strength (Table 6).

DISCUSSION

This cross-sectional analytical study involving 322 adolescents (180 with intellectual disability [ID] and 142 without ID) aimed to compare physical activity levels, sedentary behaviour, and physical fitness between the two groups, and to examine associations between body composition and motor performance. The findings indicate that boys with ID have significantly lower physical activity levels, higher sedentary behaviour, and reduced motor performance compared with their peers without ID. These differences are accompanied by an unfavourable body composition profile, characterised by lower muscle mass and higher adiposity. In particular, reduced muscle mass and increased waist circumference were associated with poorer balance and flexibility, whereas upper limb strength appeared relatively preserved.

These findings are consistent with previous literature reporting that adolescents with ID often have higher fat mass and poorer physical fitness, particularly in balance and flexibility (Farías et al., 2022; Totsika et al., 2022). They also confirm that body composition is an important determinant of motor performance in this population. The association analyses further show that muscle mass is positively related to balance and flexibility, highlighting its role in postural control and functional stability. Conversely, waist circumference is negatively associated with these motor abilities, suggesting that central adiposity may impair coordination and reduce movement range. Total body fat was not consistently associated with motor outcomes, indicating that fat distribution particularly abdominal fat may be more relevant than overall adiposity in explaining functional limitations (Ferrero et al., 2023; Wang et al., 2022).

High sedentary behaviour combined with low physical activity levels in adolescents with ID may contribute to worsening body composition and reduced motor performance, as previously reported (Yilmaz & Mirze, 2024; Delfa et al., 2025). These findings support the existence of a negative cycle linking sedentariness, increased adiposity, and reduced functional capacity (Gutiérrez-Cruz et al., 2025; Li & Hu, 2025).

Regression analyses confirmed that muscle mass is a positive predictor of balance, while waist circumference exerts a significant negative effect. Overall, motor performance in adolescents with ID appears to depend more on body composition quality, particularly muscle mass and central adiposity, than on total body fat (Zwack et al., 2023). Enhancing muscle mass and reducing abdominal adiposity should therefore be considered key targets for improving functional autonomy in this population (Beck et al., 2022; Yuan, 2021).

This study highlights significant inequalities in physical health among male adolescents with intellectual disability. Compared with their peers without ID, they exhibit higher levels of sedentary behaviour and adiposity, as well as lower levels of physical activity and physical fitness, particularly in balance and flexibility. The findings also underline the key role of muscle mass in physical performance and the strong association between body composition and physical fitness. These results emphasise the need for concrete action at both practice and policy levels. The development and implementation of inclusive, accessible adapted physical activity (APA) programmes tailored for adolescents with ID in school and community settings are essential. Strengthening the capacity of teachers, educators, and health professionals in APA is also a key priority.

Furthermore, the integration of inclusive public policies ensuring equitable access to environments that promote physical activity is crucial, particularly in low-resource settings such as the Democratic Republic of Congo. Multisectoral strategies involving families, schools, and communities may help reduce sedentary behaviour, improve physical fitness, and ultimately decrease the risk of non-communicable diseases in this vulnerable population.

Limitations and Future Research Directions

Several limitations should be acknowledged. The cross-sectional design limits causal inference. Although the sample size (n=322) was adequate, it may not allow full generalisation of the findings. The physical activity questionnaire was not validated in the Congolese context. Additionally, potential confounding factors such as nutrition and socioeconomic status were not controlled. Another limitation of this study is the reduction of physical activity and sedentary behaviour variables to nominal/ordinal scales, rather than retaining interval/ratio-level data. This resulted in a loss of information and restricted the statistical analyses to chi-square tests instead of more powerful approaches such as ANOVA or regression models suited to continuous data. Consequently, the full variability of the original data may not have been adequately captured, potentially limiting the sensitivity and depth of the findings. Future research should include longitudinal or intervention-based designs focusing on adapted physical activity programmes, incorporate additional physical fitness indicators, control for confounding variables, and validate assessment tools in the Congolese context.

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Authors' Contributions

Conceptualisation: TB, BM, PB, GB, AB, CN, MK, VF
Data collection: TB, EK
Statistical analysis: TB, MK, EK
Manuscript writing: TB, BM, PB
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